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System and method for managing messaging services

Field of the invention

The present invention generally relates to messaging services and
5   new possibilities to deploy a messaging service and after that to control,
adjust, and report the use of the messaging service.

Background of the invention

Messaging-based commercial services available today mainly use
10   the short message service (SMS), the enhanced messaging service (EMS),
and the multimedia messaging service (MMS) messages to reach users/
customers. Messaging markets have recently been changed so that the
share of person-to-person messaging revenues will decrease and the share
of other messaging revenues will increase. For example, messaging reve-
15   nues related to entertainment and advertisement will probably increase in the
next years. Uncontrolled service management requires the implementation of
a number of various communication methods between the network operators
and the service providers. A service provider may need to use different
communication methods with different network operators. A communication
20   method includes more than message routing and an application protocol,
such as wireless application protocol (WAP). For example, the SMS centres
of different network operators may require different protocols. Using a mes-
sage router, such as the First Hop message router manufactured by the
applicant, can solve the drawback of different communication methods. The
25   message router provides so called messaging connectivity.

FIG. 1 shows a controlled service management provided by a
message router. There are three service providers, one service operator, two
network operators, and a set of terminals. The message router 101 of the
service operator transmits messages between the services and the network
30   operators, such as a service 102 and a network operator 103. For example,
the service 102 can communicate with the SMS centres of both the network
operators via the message router. Thus, the service 102 does not need to
know SMS center-specific details; it just needs to know one communication
method, which it uses with the message router.

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A message router implements the messaging connectivity, but the messaging connectivity solves only part of the drawbacks.

FIG. 2 illustrates the use of a messaging service. The messaging service 201 receives a user message 202 sent by an end-user 203 and as
5   response to the message received, the messaging service 201 sends a response message 204 to the user. The messaging service may include some means for processing messages, but it is uneconomical to implement and update the said means of a number of messaging services.

The applicant's patent application FI20011813 concerns process-
10   ing SMS messages. This 14th of October 2001 filed application teaches that messages must be classified to make the handling of messages possible. The classification can be done by the user or by some administrator. The classification is defined with a special programming tool generated for this purpose. Known programming tools, like editors, and techniques can be used
15   to produce the classification and processing rules. The processing rules define how messages are processed. A processing code implements these processing rules. The processing code may be, for example, executable code or interpretable code, like Java or some scripting language.

In more detail, the classification of messages is based on some
20   characteristics of messages, for example, on sender, length, date, time, or price information of messages. Also the location of a sender can be a criterion of the classification. The classification can also be based on the content of the message, which can be traced by comparing, for example, matching words or bit patterns. The type of the message may as well be one possible
25   basis for the classification. The message can be plain text, sound, picture, data accepted by MMS, some OTA (over-the-air) application or any combination of those mentioned.

The classification affects which processing rules are obeyed, and which processing code is run for a message received. For example, the said
30   message is: 1) rejected or deleted, 2) altered, or 3) directed to other media than the original receiver, e.g. an email or a web site or even to another SMS-gateway, 4) saved to a database, 5) responded to with certain logic or 6) left untouched and transmitted to the receiver. It is also possible to store only the statistical information about the message or the message may be
35   stored for a later transmission.

The patent application FI20011813 contains profitable solutions for classifying messages and handling the said messages according to certain processing rules. However, the controlling and managing aspect is poorly observed. For example, a common mechanism for controlling the deployment of a messaging service is missing from the prior art. The deployment includes, among other things, the commissioning tests of a messaging service. Also a common mechanism for authorizing and supporting the use of messaging services is still missing from the prior art.

The main drawbacks of the prior art are listed in the following.

The first drawback is that processes and tools for allowing service providers to test and deploy messaging services are incomplete.

The second drawback is that the billing models and services are inflexible for new innovative services.

The third drawback is a lack of proper business reporting facilities, which increases business risks.

The fourth drawback is an inability to sufficiently control different type of users and their access to services.

The fifth drawback is that operators cannot sufficiently control how the private user data is provided for service providers.

The sixth drawback is that services often fail to take into account different user preferences.

The seventh drawback is that a user often fails to connect to services because of erroneous terminal configurations.

Summary of the invention

The objective of the invention is to solve the drawbacks of the prior art and define and implement a new type of system for managing messaging services. The said system is termed a "messaging manager".

The messaging manager has five main tasks: service provider management, service management, user management, customer care management, and managing the quality of service.

Service provider management comprises rules and functions related to the service set of a service provider, routing and billing options, and limitations which a service operator set for the service set.

Service management comprises the service deployment through a well-defined process, routing and billing settings, service interfaces, and access control.

User management comprises provisioning of a service through the Internet, WAP or short message service (SMS), logins to the service, user preferences, and terminal specific settings.

Customer care management comprises means for acting on behalf of an end-user. These means are used, for example, when an end-user action has failed for some reason.

Managing the quality of service comprises means for guaranteeing a certain quantity of resources for a service. A service provider can choose the level of the quality of service, or the operator may force a certain level.

These tasks are either performed in the prior art in a service or they are not performed at all. In addition, the messaging manager provides statistics and reports on e.g. the usage volumes of services.

The objective of the invention is achieved by locating the messaging manager between the end-users and services, so that end-users' messages and services' response messages are routed via the messaging manager. The messaging manager is preferably connected to a message router. The most important element of the messaging manager is a profile database that contains profiles for service providers, services, end-users, and customer care. A profile is a data collection that can be created and updated through a user interface, which is most typically a Web interface, and then can be stored in the profile database.

The system is adapted to: 1) receive a message that belongs to a communication between an end-user and a messaging service, 2) obtain data from the message, and when the obtained data is a search key, 3) search at least one profile stored in a profile database by using the search key, wherein a profile is a data collection containing information about either service providers, services, end-users, or customer care, and when found, 4) perform at least one task defined by at least one profile found. When the obtained data is not a search key, the search key is generated by a certain function, which uses the said data as an input.

Brief description of the drawings

The invention is described more closely with reference to the accompanying drawings, in which

5   Figure 1   shows a message router routing messages between services and network operators,

        Figure 2   illustrates the use of a messaging service,

        Figure 3   shows an example of the controlled use of a messaging service through the messaging manager,

10   Figure 4   shows the message manager accessing a profile from a profile database and performing a task,

        Figure 5   shows the architecture of the message manager.

Detailed description of the invention

15   Messaging manager is a system for managing heterogeneous messaging services. The said messaging services may be based on e.g. SMS, EMS, MMS, or WAP. The messaging manager enables a service operator to run messaging services while having full business control over the service provisioning and service revenues. Maintaining an evolutionary and

20   dynamic set of messaging services is a key for maximizing service revenues. This sets requirements for a rapid, but controlled, service deployment environment. In order to achieve a win-win situation between a service operator and the third party service providers, the messaging services and business models should be flexible and easy to understand and implement. The messaging

25   saging manager provides a service deployment process improving the time-to-market of messaging services.

        FIG. 3 shows an example of the controlled use of a messaging service through the messaging manager. The messaging service, or briefly, the service 301 receives through the messaging manager 304 a user mes-

30   sage 302 sent by an end-user 303. As response to the message received the service 301 sends an output message 305 through the messaging manager 304 to the end-user 303. The use of the service 301 is controlled in several ways. For example, the messaging manager checks whether the user is allowed to use the service. In addition, the messaging manager may in

35   someway change the content of the user message. In this example, the messaging manager adds a piece of information 306, in more detail, the user's

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terminal type, to the user message 302. The input message 307 of the service 301 includes the user message 302 and the piece of information 306. Therefore the user message 302 is not exactly the same as the input message 307 received by the service 301. Correspondingly, the response message

5   sage 308, which the end-user 303 receives, is not exactly the same message 305 that the service has sent. The contents of the messages 308 and 305 are the same, but the message formats are not, which is symbolized with lineation.

Some services are so called push services in which a service just

10 pushes messages to an end user. A service transaction may be a one-way transaction, in which case an end-user does not respond to the messages. On the other hand, a push service may initiate a service transaction shown in FIG 3. Thus, the service transaction may include transmission of a number of messages to many parties. The said messages may be of one or several

15 message formats, such as SMS or MMS formats.

A message sent by an end-user is termed "a user message". The message that the messaging manager sends to a service is termed "an input message". A message sent by the service is termed "an output message", and the message that the messaging manager sends to the user is termed "a

20 response message".

The messaging manager may send several output messages per one user message and the messaging manager may send several response messages per one output message.

The messaging manager receives user messages and output

25 messages and creates input messages and response messages. The following list concerns the content and format of these messages: 1) the content of a user message may or may not be the same as the content of an input message, 2) a user message may contain more bits than an input message, 3) a user message may contain fewer bits than an input message, 4) the format of

30 a user message may or may not be the same as the format of an input message, 5) the content of a response message may or may not be the same as the content of an output message, 6) a response message may contain more bits than an output message, 7) a response message may contain fewer bits than an output message, 8) the format of a response message may or may

35 not be the same as the format of an output message.

FIG. 4 shows an example of the message manager accessing a profile from a profile database and performing a task. The profiles stored in the profile database are a certain type of data collections. When an end-user 401 wants to use a service 408, he/she sends a message 402 via the mes-
5   saging manager 403 to the service. The message 402 includes one piece of information that is a search key. The message manager obtains the search key 404 from the user message and accesses a profile 405 from a profiles database 406 by using the search key. After that, the messaging manager performs a task defined in the profile accessed 404. According to the task,
10   the messaging manager sends an input message 407 to the service 408.

In the above example a message included one search key. However, a message may include more than one search key. Each search key is one or more pieces of information located in a message. A search key may be located in the header of a message or in the data part of the message.

15   A search key may, for example, be the sender or the receiver of the message. Thus, the content of a search key is sometimes the same as in the characteristics of a message described in FI20011813. However, a search key is certain data that is intended for searching profiles from a profile database. The characteristics of a message is not necessary usable for
20   searching profiles and it is not intended for that. The characteristics of a message may affect which method is used to obtain a first search key from the message.

It is also possible that a search key is not explicitly defined in the message. Then a certain piece or pieces of information, such as time, date,
25   operator's name etc., are obtained from the message and used as an input to a function, which generates the search key. The information pieces may also be read from one or more profiles. The said function is a specific algorithm for generating search keys. It may be very simple, so that it just concatenates, for example, the first two and last two bytes of the message.

30   In the next example the function F obtains the message type$_i$, date, and an operator name as input and generates the search key k_i :

k_i = F(message type$_i$, date, operator name),

wherein index i refers to the message type$_i$ and a type of the search key k_i. There could a certain type of the search key k_i for different

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profiles, such as user profiles, service profiles, service provider profiles, etc. The message type of received messages may differ from each other. For example, a user message and a service message may be of different types.

To summarize: there are basically three methods to obtain a
5   search key.

The first method is based on reading a predetermined number of bytes starting from a certain byte of a message. For example, a search key is obtained by reading eight bytes starting from the seventh byte of a message.

The second method is based on searching a bit or text pattern
10   from a message, wherein the said pattern determines the location of a search key. For example, the text pattern could be "service provider:" and the search key could be found after this text pattern.

The third method is based on using a function that obtains one or more pieces of information as input and generates a search key.

15   The type of message may affect which method is used. For example, if the message is a type of extensible mark-up language (XML), the messaging manager could use the second method to obtain a search key from the message.

A profile is a data collection stored in a profile database. Typically,
20   the profile database includes various types of profiles, so that there is an own profile type for service providers, services, end-users, and customer care. It is possible that a database search does not result in any profile. It is also possible that a database search results in several profiles, i.e. the search key used matches several profiles. For example, a search key could be an
25   MSISDN of the sender of a message, and the said search key could match to one user profile and one service profile. The messaging manager performs database searches by using predetermined logic.

A profile may include one or more search keys referring to other profiles, and said profiles may include more search keys. Thus, the profiles
30   may have one-to-one and one-to-many relationships based on search key values. The profiles can be stored in a relation database. The relation database model is a good choice when each profile includes at least one unique search key value.

A profile defines at least one task that the messaging manager should perform. The tasks could be numbered, for example, so that '1' means "direct a message to a receiver's MSISDN" and '2' means "direct a message to a receiver's email address". Thus, if the profile accessed from the database includes '2', the messaging manager directs the message to the receiver's email address. If required, a task may be a running processing code as described in FI20011813. However, the processing code is run only if the database search results in a profile that allows the running.

To-summarize: one message may include one or more search keys and each search key may match to none or one, or more profiles, and each profile may define one or more tasks.

The messaging manager is adapted to:

1) receive a message belonging to a communication between an end-user and a messaging service,

2) obtain at least one search key from the message,

3) search at least profile from a profile database by using the search key, wherein the profile database contains information about service providers, services, end-users, and/or customer care, and when found,

4) perform at least one task defined by at least one profile found.

The messaging manager is preferably located on top of a messaging connectivity platform, in more detail, on the top of a message router, such as the First Hop message router.

The messaging manager is equipped with, for example Web-based, user interfaces through which users of different user groups can create and update their profiles. A user must first authorize himself/herself by inputting, for example, a user identifier and a password. After that he/she is allowed to handle profiles. The user groups controlled by the messaging manager are: service operators, service providers, end-users, and customer care personnel.

A service operator can manage its service providers by means of the messaging manager. Each service operator is the "superuser" of its own system and can override all settings made by e.g. a service provider.

Service providers can manage their individual services according to permissions granted by service operators. Service providers can assign routing and billing rules for services. They can also use interrogation means to have reports and statistical information about their services.

5   . Users can access the messaging manager either by using a Web interface, WAP, SMS, MMS, or other messaging technique, and they can provide their terminals with correct settings for service accesses, and subscribe or unsubscribe to services. Users also have access to their preferences and service login information.

10   Customer care personnel can act on behalf of individual endusers, for example, by setting terminal configurations or by performing the service subscription of an end-user. The customer care personnel are also able to offer a message re-sending capability.

The messaging manager has five main tasks: service provider
15   management, service management, user management, customer care management, and managing the quality of service. These main tasks are discussed in more detail.

Service Provider Management. A service operator registers a new service provider by using the messaging manager. In more detail, the
20   service operator creates a profile for the service provider through the Webbased user interface, or another user interface, of the messaging manager. The service operator has a profile for each of its service providers. A service provider profile includes: a billing model, service usage limitations, service deployment rights, routing rules, and/or a choice of MSISDN forwarding.

25   The billing model sets the billing options for the services of a service provider. A service can set price/tariff information to the messages it sends. The messaging manager sets certain limitations defining how the service is allowed to set the price/tariff information. Alternatively, a service provider obtains a list of price/tariff tags, which the service provider's service
30   can use in its messages and thus demand the messaging manager to set certain price/tariff information to the messages. The messaging manager controls the use of price/tariff tags. For example, if the service provider tries to charge more than it is allowed to, the messaging manager can 1) block the

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service transaction, 2) block the use of the service, and/or 3) provide a warning for the service or service provider.

Of course, it is also possible that either the message router or the messaging manager takes care of the billing process on behalf of a service.

5   If required, messages can be charged to a service provider. For example, a message containing an advertisement could be charged to a service provider instead of an end-user. It is also possible to share a charge so that an end-user pays a part of the charge and e.g. an advertiser pays the rest of the charge.

10   The message router considers the above-mentioned billing options when it creates a CDR. The format of the CDR is customizable to match the requirements of a billing mediation system. Another billing method than the method based on CDRs can be used, too.

For example, billing capabilities provided by SMS centers can be 15   used, so that the messaging manager advises the message router to send a billing message to the SMSC. The billing message contains the charging information in a form that is understandable for the SMS center, and thus the SMS center is able to write an appropriate CDR. The end-user may also receive the billing message as a receipt of the ended transaction.

20   A service provider may be given an option to delegate all or some subset of its rights to another service provider. This is advantageous, if for example, the delegating service provider manages a retail shop chain, and the party to which the rights are delegated manages one of the retail shops.

The service usage limitations are used, for example, to restrict the 25   number of services that the service provider can deploy. In addition, the maximum throughput of a service can be controlled. The throughput is measured, for example, as messages per second, or as the number of messages

Service deployment rights concern the deployment of a service. A 30   right for a SMSC simulator test permits a service provider to deploy a service, but only for testing it in the SMSC simulator. End-to-end test right means that a service can be deployed for live testing, with a limited number of users. The private usage right means that a service is associated with a whitelist of such MSISDNs that are allowed to use the service. A service provider who has the

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private usage right can manage its whitelists. Public usage right means that a service is public and available to all users not listed in a blacklist. The service provider maintains the blacklist associated with the service. A service operator may also define that some of its service providers have no service de-
5   ployment rights. Then the service provider requests the service operator to grant a certain right for a certain service.

Routing rules concern short codes that make the use of a service easier. A service operator may assign a number of unique short codes for a particular service provider. It is also possible to share a short code between
10   service providers. Here, the short code is a specific short telephone number identified and used by SMS centers to differentiate user-to-service messages from user-to-user messages.

MSISDN forwarding means that a service will receive the MSISDN of a sending terminal. Otherwise, a random code will be used instead.

15   In addition to the options described above, the service operator can maintain system wide black- and white lists of users and services. These access control lists override all the other access control definitions made in a service level or user level.

Service Management. As mentioned above, a service operator
20   creates a profile for its service provider. In this way, the service operator can control its service providers. Correspondingly, each service provider manages its individual services by creating a profile for a service. The service provider profile created by the service operator determines which choices and settings the service provider is able to make for a service. A service
25   profile could include, for example: a choice of billing model, an access control list, and a choice of a short code.

In addition, the operator may provide tools for its service provider to create other service providers. Typically, these tools are equipped with a Web interface through which the service provider can input service provider
30   specific information, i.e. the service provider can create and update service provider profiles and, of course, service profiles.

The billing model defines how and to whom the use of a certain service is billed. The billing model may only be one of those mentioned in the service provider profile.

Access control is based on a black list or white list. Different lists can be used in the different deployment phases mentioned above.

A short code is used to route messages. The short code may only be one of those mentioned in the service provider profile.

5   A service provider promotes a new service through predetermined deployment phases: 1) SMSC simulator tests, 2) end-to-end tests, and after that 3) either private usage or public usage phase. If the SMSC simulator tests are successful, the service provider or the service operator grants the end-to-end test right for the new service.

10   The service provider's interface provides an access to statistical information concerning the usage of the service provider's services. The statistical information may concern, for example, the number of successful mobile-originated and mobile-terminated messages for a predetermined period of time, or the number of failed messages. The service provider also
15   has access to the log information of end-users.

User management. An end-user may access the messaging manager by his/her terminal to subscribe or unsubscribe to a service. The end-user interface is implemented as a Web interface or via SMS. Through these interfaces an end-user can, for example: 1) specify his/her terminal
20   type, 2) order WAP, GPRS or MMS settings to his/her terminal to be able to connect to a service, 3) subscribe/unsubscribe to a service, 4) update his/her MSISDN stored in the whitelist of a service, and 5) access the statistical information of his/her service usage.

When an end-user subscribes to a service, the service creates an
25   end-user profile. The end-user profile includes e.g. an MSISDN, a terminal type, and terminal settings.

The user management can also consider the mutual relationships of end-users, such as a breadwinner-child relationship, or an employee-employer relationship. Profiles may have a mutual hierarchical relationship,
30   wherein the said profiles include some identical piece of information. An end-user profile, which is on a higher level in the hierarchy, limits or replaces the definitions of one or more end-user profiles.

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For example, a breadwinner's profile may limit which services the breadwinner's child can use. Thus, when a message sent by the child is received in the messaging manager, the breadwinner's profile is accessed from the database and the permission to use a certain service is checked
5   from the breadwinner's profile.

Another example concerns an employee-employer relationship and sharing messaging charges. An employee and employer have their own profiles. Thus, when the employer's message is received in the messaging manager, the employer's and the employee's profiles are accessed from the
10   database. The employer's profile may define some task that the messaging manager performs. However, a task related to charging is defined in the employee's profile.

For example, an employer could pay for a service during working hours, and outside working hours the employee should pay for the service. A
15   good example of such a service would be an SMS-based parking payment service, i.e. during working hours the employer pays the car parking and outside of working hours it is paid by the employee. The decision of how much and who is billed is based on available information, such as date, time, location information, etc.

20   **Customer care management.** The customer care has means for acting on behalf of an end-user. Customer care does not need to know the password of an end-user to perform the same operation that the end-user is able to do.

If required, customer care can resend a message that an end-
25   user has earlier tried to send to a service. This message and an associated output message of the service are not charged to the end-user.

A service operator or a service provider can define a profile for its own customer care. That customer care profile includes e.g. the employees and passwords of the customer care.

30   **Managing the quality of service.** The quality of service (Qos) for a messaging system is related to several viewpoints. The main viewpoints are: 1) the throughput defined as messages per a time unit and 2) the maximum response delay for a message sent by an end-user. The time unit could be

e.g. a second, an hour, or a month. The maximum response delay is often inversely proportional to throughput.

The messaging manager monitors the resource usage of the messaging system and allocates the resources to services according to their quality of service levels. The quality of service (Qos) level indicates the promised minimum performance, instead of the maximum performance or average performance. The minimum performance is measured as messages per time unit or as the number of messages. For example, the minimum performance is achieved when a certain service has sent a thousand messages.

Monitoring the resource usage of the whole messaging system and its individual services benefits both the service provider and service operator. The service provider monitors the resource usage in order to react to the following two situations.

1) When a service has gained popularity among the end-users, it should be ensured that the said service continually behaves in a satisfactory manner.

2) When the popularity of a service drops and it no longer brings revenues to the service provider, the service should either be taken off or less money should be spent on its QoS level.

Also the service operator monitors the resource usage of services. Then the service operator can purchase, for example, an adequate volume of SMSC center connections based on the resource usage and also based on the QoS levels. For example, if four services have a QoS level that guarantees message throughput of 100 messages per second and the maximum capacity of the messaging system is only 300 messages, a problem occurs if the four services simultaneously use their maximum capacity. To solve this problem the messaging manager is adapted to continuously 1) calculate the resource usage of each service and 2) calculate the sum of the resource usage of services. Thus, the messaging manager detects a possible overload situation. In addition, a Qos level includes a traffic priority.

The traffic priority has the following impact: if the messaging system is overloaded, the services whose QoS includes the highest traffic priority are served first. Relating to the above example, the overload is in practice avoided by allowing a high traffic priority for three of the four services and a

low traffic priority for one of the said services. Then the service having the low traffic priority must wait its turn, if the three services use their maximum capacity, 100 messages per second.

5   The messaging manager is adapted to use two methods for reducing traffic: 1) delaying the processing of a message until the messaging system is no longer overloaded, or 2) deleting the said message. The choice of a method for reducing traffic could be also included in a QoS level.

The quality of service information may be included in profiles, for example, in service provider or service, or user profiles. When the messaging
10   manager accesses a profile from the profile database, it can obtain the required quality of service information from the profile accessed.

To summarize: a Qos level includes at least the promised minimum performance, which is measured, for example, in messages per second. In addition, the QoS level may include the traffic priority and/or the choice of
15   method for reducing traffic. The messaging manager can control that each service obtains the QoS level that the service provider has chosen.

Architecture of the messaging manager. The messaging manager and message router are located behind a firewall to eliminate hostile accesses to a messaging system

20   FIG. 5 shows the architecture of the messaging manager. The messaging manager 501 contains: the logic for its five main tasks 502-506, the profile database 507, the transaction database 508, and the user interfaces 509-512. The user interface 509 of the service provider management is intended for a service operator, the user interface 510 of the service man-
25   agement is intended for service providers, the user interface 511 of the user management is intended for end-users, and the user interface 512 of the customer care management is intended for customer care personnel. Through these user interfaces the service operator, service providers, end-users, and customer care personnel can access and modify their profiles
30   stored in the profile database. A message router 513 communicates with an end-user 514 and a messaging service 515. The messaging manager 501 receives messages from end-users and services via the message router 513.

A service operator may register a service provider in the service operator's messaging system. After registering, the service provider can deploy and manage its services. The same applies to end-users, who must first authenticate themselves before they are allowed access to their user profiles.

Typically, each service provider, service, and end-user has its own profile. Customer care may have an individual profile or the customer care information may be included in a service operator profile or service provider profile.

A service provider can customize the user interface intended for its customer care personnel. Furthermore, the service provider may be allowed to implement an external user interface for its end-users.

The messaging manager uses the profile database when one of its service providers aims to deploy a service in a server. From the message manager's point of view it is irrelevant who owns the said server or where it is located, the messaging manager checks from the service provider's profile whether the deployment operation is permissible or not. After a permissible service deployment, the messaging manager uses the profile database to control the usage of the service.

Profile database is also useful, for example, when a service provider wants to customize its service for different types of terminals.

In another embodiment of the invention the messaging manager allows the message router and/or a service to access the profile database. Then the message router can perform certain operations. The messaging manager may allow the service to access the profile database, for example, to include service-specific parameters in end-user profiles.

The messaging manager stores the most recent service transactions initiated by users or messages in the transaction database. The transaction database can be used for several purposes.

First, the messaging manager may access transaction records stored in the transaction database and calculate statistics and form detailed business reports for service operators and service providers.

Secondly, the messaging manager may use transaction records when it guarantees a certain quality of service. In this case, the transaction records are counters for counting the resource usage of services.

Thirdly, the transaction database stores the access history of each user within a specified time period, thus enabling the customer care personnel to quickly react to an unsuccessful user action.

The transaction database may be located in a main memory or in a disk memory. The same applies to the profile database.